

THE ELECTROCHEMICAL AND SOLID STATE
PROPERTIES OF Ni(II) INCORPORATED β -
FeOOH.

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Ni alloying is reported to enhance the corrosion resistance of steel in chloride-rich environment such as seashore where conventional weathering steel shows high corrosion rate and has been the subject of interest recently. It is seen that high corrosion resistance of weathering steel is observed only after long-term exposure. This indicates that the formation and properties of rust layer that determines long-term behavior of atmospheric corrosion of steel may be affected by alloying elements. And hence the works on atmospheric rusting of Ni alloyed steel is necessary to establish the mechanism for atmospheric corrosion of Ni alloyed steel and develop Ni alloyed steel for new weathering steel.

Several iron oxides/hydroxides such as α -FeOOH, β -FeOOH, γ -FeOOH and Fe_3O_4 are observed mainly on steel exposure to chloride-containing atmosphere. β -FeOOH is formed only under chloride containing atmosphere and also has Cl^- ion in its structure. Cl^- ion can easily reach steel surface through that. Further, β -FeOOH is electrochemically reduced to Fe_3O_4 , which accelerates the atmospheric corrosion of steel. It has been known that β -FeOOH is responsible for high corrosion rate of steel.

β -FeOOH is reported to accommodate Ni(II) in its structure, however, there is lack of research on properties of Ni incorporated β -FeOOH. Therefore, the present study reports on the influence of Ni(II) on electrochemical and solid state properties of β -FeOOH.

Ni(II) incorporated β -FeOOH was prepared from mixed solution of NiCl_2 and FeCl_3 with various ratio of Ni(II) to Fe(III) through hydrolysis at 80°C for 3hrs. Structural changes were investigated with X-Ray diffraction and FT-IR techniques. And final products were examined by differential scanning calorimetry, thermal gravimetric analysis and Atomic Adsorption Spectroscopy.

Keywords: atmospheric corrosion, Ni alloyed steel, weathering steel, Cl^- , β -FeOOH,